WEB MATERIAL

WEB APPENDIX

Web Appendix 1. Inverse probability weights: construction and results of weighting models

The stabilized inverse probability weight $SIPW_{ij}$ for individual *i* at outcome wave *j* (outcomes were assessed at waves 3 to 8) was the product of the inverse probability of survival weight ($IPSW_{ij}$), the inverse probability of remaining uncensored weight ($IPUCW_{ij}$), and the inverse probability of exposure to high SES at each time point weights ($IPEW1_i$, $IPEW2_i$, $IPEW3_i$). For a participant to be in our sample at outcome wave j, and therefore uncensored at outcome wave *j*, we required the participant to be alive and in the study at wave *j* and have a memory score outcome assessed at wave *j*. Since we required all participants to be in the study and have a memory score outcome at wave 3, the first outcome wave, those participation and survival weights are set to 1 and we calculate the weights beginning in wave 4. We restricted all IPW models to our final analytic sample of 6,459 which has full information on SES at each time point, memory score in the first outcome wave (wave 3, year 2002), and all covariates (at wave 1, year 1998).

The $\mathrm{IPEW1}_i$ was estimated as the probability that individual *i* had high childhood SES given covariate values for covariates that were hypothesized to be temporally prior to childhood SES. The $\mathrm{IPEW2}_i$ was estimated as the probability that individual *i* completed high school (or college) given that individual's childhood SES value and covariate values for covariates that were hypothesized to be temporally prior to high school (or college) completion. The $\mathrm{IPEW3}_i$ was estimated as the probability that individual *i* had high late life income (measured in 2000, at wave 2) given that individual's childhood SES and high school completion value as well as covariate values for covariates that were hypothesized to be temporally prior to late life income.

The $\mathrm{IPSW}_{i\bar{j}}$ was estimated as the probability that individual *i* survived through wave *j* given that individual *i* participated in wave *j*-1 and given individual *i*'s SES at each time point and covariate values at time *j-1*. The $\mathrm{IPUCW}_{i\bar{j}}$ for each outcome wave *j* was estimated as the probability that individual *i* remained in the study through wave *j,* given that individual *i* participated up to wave *j-1*, survived up to wave *j*, had a memory score outcome assessment at wave *j*, and given individual *i*'s SES at each time point and covariate values at time *j*-1. Since the $\mathrm{IPSW}_{i\bar{j}}$ and the $\mathrm{IPUCW}_{i\bar{j}}$ were time-updated, each weight was accumulated across all prior waves *j*.

Therefore $\mathrm{SIPW}_{i\bar{j}}$= $\mathrm{IPSW}_{i\bar{j}}$X $\mathrm{IPEW1}_i$ X $\mathrm{IPEW2a}_i$ X $\mathrm{IPEW2b}_i$ X $\mathrm{IPEW3}_i$ X $\mathrm{IPUCW}_{i\bar{j}}$with each component defined as below. Where *S* is survival, *SES* is exposure status (i.e., SES_1 is high childhood SES, SES_2 is both (a) high school completion and (b) college completion, and SES_3 is high late life income, which is the only SES measure that can be either time-constant or time-varying), *UC* is being uncensored, *k* indexes the interview wave, *V* is a vector of time-constant covariates grouped according to temporal order (i.e. V_1 are covariates that are temporally prior to childhood SES, V_2 are covariates that are temporally prior to early adult SES and temporally after childhood SES, V_3 are covariates measured in 1998 that are temporally prior to late life SES (in 2000) and temporally after childhood SES and early adult SES), *L* is a vector of time-varying covariates from the wave prior to the outcome wave (*j-1*), *W* is a vector of dummy variables corresponding to each of the study waves.

(1) $$IPEW1_i = \frac{Pr[SES_{1i}|V_{1i}]}{Pr[SES_{1i}|V_{1i}]}$$

(2) $$IPEW2_i = \frac{Pr[SES_{2i}|V_{1i},SES_{1i}]}{Pr[SES_{2i}|V_{1i},V_{2i},SES_{1i}]}$$

(3) $$IPEW3_i = \frac{Pr[SES_{3i}|V_{1i},SES_{1i},SES_{2i}]}{Pr[SES_{3i}|V_{1i},V_{2i},V_{3i},SES_{1i},SES_{2i}]}$$

(4) $$IPSW_{i\bar{j}} = \Pi_{k=4}^{j} \frac{Pr[S_{ik}|V_{1i},W,UC_{ik-1}=1,S_{ik-1}=1]}{Pr[S_{ik}|V_{1i},V_{2i},SES_{1i},SES_{2i},SES_{3ik-1},W,L_{ik-1},UC_{ik-1}=1,S_{ik-1}=1]}$$

(5) $$IPUCW_{i\bar{j}} = \Pi_{k=4}^{j} \frac{Pr[UC_{ik}|V_{1i},W,UC_{ik-1}=1,S_{ik}=1]}{Pr[UC_{ik}|V_{1i},V_{2i},SES_{1i},SES_{2i},SES_{3ik-1},W,L_{ik-1},UC_{ik-1}=1,S_{ik}=1]}$$

We estimated both the numerator and the denominator of the weights with pooled logistic regression models. Once we multiplied all of the weights together, we trimmed them at the 99th percentile.

Web Table 1. Results from pooled logistic regression models for estimating the denominators of the inverse probability of survival (IPSW), the inverse probability of exposure weights (IPEW), and the inverse probability of participation weights (IPUCW)

	IPEW1 β (95% CI)	**IPEW2a*** β (95% CI)	**IPEW2b**** β (95% CI)	**IPEW3** β (95% CI)	**IPSW** β (95% CI)	**IPUCW** β (95% CI)
Intercept	-36.805 (35.231, 35.231)	-68.363 (37.193, 37.193)	-44.741 (45.411, 45.411)	2.269 (44.372, 44.372)	-119.99 (-150.41, -89.57)	-4.69 (-52.45, 43.08)
male	0.136 (0.081, 0.081)	0.022 (0.11, 0.11)	0.763 (0.102, 0.102)	0.387 (0.108, 0.108)	-0.31 (-0.42, -0.2)	0.16 (0.03, 0.29)
race_black	-0.773 (0.132, 0.132)	-0.843 (0.141, 0.141)	-0.352 (0.184, 0.184)	-0.45 (0.175, 0.175)	0.63 (0.47, 0.78)	0.04 (-0.13, 0.22)
race_other	-0.443 (0.295, 0.295)	-0.606 (0.337, 0.337)	0.534 (0.331, 0.331)	-0.479 (0.34, 0.34)	0.4 (0.03, 0.77)	-0.5 (-0.83, -0.18)
SOUTHBPLACE	-0.452 (0.116, 0.116)	-0.465 (0.131, 0.131)	-0.055 (0.148, 0.148)	-0.162 (0.129, 0.129)	0.05 (-0.07, 0.18)	0.01 (-0.14, 0.16)
birthyear_cat2	-20.965 (87.13, 87.13)	25.791 (105.367, 105.367)	46.718 (110.379, 110.379)	-197.70 (97.932, 97.932)	-31.29 (-122.31, 59.73)	-69.12 (-193.01, 54.76)
birthyear_cat3	-75.709 (94.916, 94.916)	40.932 (124.127, 124.127)	61.034 (121.575, 121.575)	-113.30 (107.564, 107.564)	200.09 (78.68, 321.5)	7.59 (-130.88, 146.06)
birthyear_cat4	-69.425 (68.132, 68.132)	-50.681 (97.313, 97.313)	-13.729 (82.249, 82.249)	-138.50 (81.567, 81.567)	-62.34 (-172.09, 47.41)	45.3 (-40.67, 131.28)
birthyear_slope1	0.019 (0.018, 0.018)	0.036 (0.019, 0.019)	0.022 (0.024, 0.024)	-0.002 (0.023, 0.023)	0.06 (0.05, 0.08)	0.0 (-0.02, 0.03)
birthyear_slope2	0.03 (0.041, 0.041)	0.023 (0.051, 0.051)	-0.002 (0.052, 0.052)	0.101 (0.046, 0.046)	0.08 (0.03, 0.13)	0.04 (-0.02, 0.1)
birthyear_slope3	0.058	0.015	-0.01 (0.058,	0.057	-0.04 (-0.1,	0.0 (-0.07,

	(0.045, 0.045)	(0.061, 0.061)	0.058)	(0.051, 0.051)	0.02)	0.07)
birthyear_slope4	0.055 (0.03, 0.03)	0.062 (0.046, 0.046)	0.029 (0.035, 0.035)	0.07 (0.036, 0.036)	0.1 (0.04, 0.15)	-0.02 (-0.06, 0.02)
rural childhood		-0.569 (0.107, 0.107)	-0.53 (0.101, 0.101)	-0.143 (0.092, 0.092)	-0.04 (-0.15, 0.08)	0.11 (-0.03, 0.25)
childhood self-rated health_high		0.523 (0.124, 0.124)	0.396 (0.146, 0.146)	0.117 (0.123, 0.123)	0.1 (-0.1, 0.3)	0.16 (-0.09, 0.42)
childhood self-rated health_low		-0.055 (0.211, 0.211)	0.183 (0.26, 0.26)	0.024 (0.218, 0.218)	0.01 (-0.08, 0.11)	0.08 (-0.03, 0.19)
startsmoke<18		-0.726 (0.115, 0.115)	-0.64 (0.118, 0.118)	0.063 (0.107, 0.107)	-0.22 (-0.32, -0.11)	0.31 (0.18, 0.45)
age1child<18		-0.789 (0.165, 0.165)	-0.623 (0.227, 0.227)	-0.318 (0.168, 0.168)	-0.24 (-0.4, -0.07)	0.0 (-0.19, 0.2)
childhood social capitol		0.057 (0.051, 0.051)	0.02 (0.053, 0.053)	0.015 (0.046, 0.046)	-0.04 (-0.08, 0.01)	-0.01 (-0.07, 0.04)
father absent		-0.38 (0.174, 0.174)	-0.566 (0.217, 0.217)	-0.05 (0.17, 0.17)	0.02 (-0.14, 0.19)	0.13 (-0.08, 0.33)
marital status: divorced/separated				-0.92 (0.157, 0.157)	-0.12 (-0.29, 0.05)	-0.03 (-0.22, 0.16)
marital status: widow				-0.795 (0.142, 0.142)	-0.12 (-0.24, -0.01)	0.03 (-0.12, 0.18)
marital status: never married				-1.104 (0.284, 0.284)	-0.27 (-0.54, 0.0)	-0.24 (-0.54, 0.05)
overweight				-0.052 (0.106, 0.106)	-0.74 (-0.92, -0.57)	0.0 (-0.13, 0.13)
obese				-0.234 (0.127, 0.127)	-0.49 (-0.76, -0.23)	0.16 (-0.06, 0.38)

vigorous physical activity				-0.077 (0.092, 0.092)	-0.27 (-0.48, -0.06)	0.06 (-0.16, 0.28)
moderate drinking				-0.273 (0.182, 0.182)	-0.34 (-0.49, -0.19)	-0.16 (-0.34, 0.01)
heavy drinking				-0.137 (0.172, 0.172)	0.39 (0.28, 0.49)	0.15 (0.02, 0.27)
smoking				-0.293 (0.133, 0.133)	0.54 (0.41, 0.67)	0.23 (0.07, 0.38)
diabetes				0.037 (0.157, 0.157)	-0.2 (-0.32, -0.09)	-0.08 (-0.24, 0.08)
hypertension				-0.085 (0.096, 0.096)	-0.12 (-0.22, -0.02)	-0.14 (-0.25, -0.02)
stroke				-0.204 (0.237, 0.237)	-0.36 (-0.47, -0.26)	0.08 (-0.06, 0.23)
heart disease				-0.113 (0.13, 0.13)	-0.36 (-0.45, -0.26)	-0.08 (-0.21, 0.04)
depression				-0.239 (0.148, 0.148)	-0.22 (-0.33, -0.11)	0.12 (-0.06, 0.31)
self-rated health_high				0.207 (0.105, 0.105)	0.36 (0.23, 0.5)	0.09 (-0.04, 0.22)
self-rated health_low				-0.443 (0.133, 0.133)	-0.7 (-0.81, -0.6)	0.01 (-0.14, 0.15)
memory score (1998)				0.234 (0.201, 0.201)	0.83 (0.75, 0.91)	0.7 (0.57, 0.82)
childhood SES		1.378 (0.124, 0.124)	1.186 (0.104, 0.104)	0.329 (0.095, 0.095)	0.02 (-0.08, 0.12)	0.06 (-0.06, 0.18)
high school completion				0.862 (0.128,	-0.11 (-0.23, 0.0)	-0.1 (-0.25, 0.04)

				0.128)		
college completion				1.083 (0.123, 0.123)	-0.13 (-0.26, 0.0)	0.14 (0.0, 0.29)
natural log of income					0.03 (0.02, 0.05)	-0.02 (-0.04, 0.0)
natural log of wealth					0.05 (0.01, 0.1)	0.04 (-0.02, 0.09)
wave 2004					4.54 (3.84, 5.25)	-0.02 (-0.2, 0.16)
wave 2006					0.94 (0.78, 1.1)	0.29 (0.1, 0.47)
wave 2008					0.01 (-0.11, 0.14)	-0.01 (-0.18, 0.17)
wave 2010					-0.37 (-0.49, -0.24)	-0.12 (-0.29, 0.06)

***2a is high school completion**
****2b is college completion**

Web Appendix 2. Implementation and Results of the Multiple Imputation

We estimated 20 imputation samples using "proc mi" in SAS, imputing values for covariates only (not for exposure or outcome variables). We used linear regression for continuous variables and logistic regression for binary variables. Next, we estimated the weighting models (for treatment, survival, and participation) in each of the imputation samples (using the "by _imputation_ statement in SAS). Finally, we estimated our final GEE models in each of the imputation samples with the corresponding weights. We then combined the results from each imputation using "proc mianalyze" in SAS. Below are the multiple imputation results that correspond to tables 3 and 5 in the main paper (i.e. the cognitive function and cognitive decline results).

Web Table 2. Multiple Imputation Results: Estimated Effects of Lifecourse SES on Memory Function from in the U.S. Health and Retirement Study, 1998-2012. Corresponds to Table 3 in the Main Paper.

	Model 1	Model 2	Model 3
	β (95% CI)		
Childhood SES	0.07 (0.06, 0.08)	0.04 (0.02, 0.05)	0.01 (-0.01, 0.03)
High School		0.19 (0.18, 0.20)	0.21 (0.19, 0.22)
College		0.09 (0.08, 0.10)	0.08 (0.06, 0.10)
Late Life Income			0.11 (0.09, 0.13)
Childhood SES*High School		-0.01 (-0.03, 0.01)	0.02 (0.00, 0.05)
Childhood SES*College		-0.02 (-0.03, 0.00)	0.02 (-0.01, 0.05)
Childhood SES*Late Life Income			0.03 (0.00, 0.07)
High School*Late Life Income			-0.09 (-0.11, -0.06)
College* Late Life Income			-0.003 (-0.03, 0.02)
Childhood SES*High School*Late Life Income			-0.042 (-0.08, -0.01)
Childhood SES*High School*College*Late Life Income			-0.04 (-0.08, 0.00)

All models are weighted to adjust for survival, participation, and exposure to high SES at each time point. The following variables were controlled for through direct inclusion in the outcome regression: birth year, southern birth place, gender, and race.

Web Table 3. Multiple Imputation Results: Estimated Effects of Lifecourse SES on Memory Decline in the U.S. Health and Retirement Study, 1998-2012. Corresponds to Table 5 in the Main Paper.

	Model 1	Model 2	Model 3
	β (95% CI)		
Childhood SES*Years	0.146 (0.130, 0.170)	0.180 (0.130, 0.230)	0.206 (0.150, 0.270)
High School*Years		0.156 (0.120, 0.190)	0.156 (0.110, 0.200)
College*Years		0.074 (0.040, 0.110)	0.067 (0.020, 0.120)
Late Life Income*Years			0.312 (0.250, 0.370)
Childhood SES*High School*Years		-0.033 (-0.090, 0.020)	-0.075 (-0.150, 0.000)
Childhood SES*College*Years		-0.016 (-0.070, 0.040)	0.048 (-0.030, 0.130)
Childhood SES*Late Life Income*Years			-0.226 (-0.320, -0.130)
High School*Late Life Income *Years			-0.132 (-0.200, -0.060)
College* Late Life Income*Years			-0.007 (-0.080, 0.060)
Childhood SES*High School*Late Life Income*Years			0.235 (0.130, 0.340)
Childhood SES*High School*College*Late Life Income*Years			-0.074 (-0.180, 0.030)
Wave: 2004	-0.109 (-0.120, -0.098)	-0.138 (-0.150, -0.126)	-0.154 (-0.167, -0.142)
Wave: 2006	-0.206 (-0.217, -0.194)	-0.265 (-0.281, -0.250)	-0.301 (-0.318, -0.283)
Wave: 2008	-0.295 (-0.308, -0.283)	-0.387 (-0.407, -0.368)	-0.441 (-0.464, -0.417)
Wave 2010	-0.447 (-0.461, -0.433)	-0.577 (-0.601, -0.552)	-0.653 (-0.683, -0.622)
Wave 2012	-0.542 (-0.558, -0.527)	-0.704 (-0.734, -0.674)	-0.798 (-0.835, -0.761)

All coefficients are for the interaction of the predictor variable and time since baseline (with time expressed in decades). Wave to wave (two year) changes in memory averaged slightly over 0.1 units. All models are weighted to adjust for survival, participation, and exposure to high SES at each time point. The following variables were controlled for through direct inclusion in the regression: birth year, southern birth place, gender, and race.

Web Appendix 3. Full Results for Table 5 from the main paper

Web Table 4. Estimated Effects of Lifecourse SES on Memory Decline in the U.S. Health and Retirement Study, 1998-2012.

	Model 1	Model 2	Model 3
	β (95% CI)		
Childhood SES	0.001 (-0.014, 0.015)	-0.010 (-0.065, 0.044)	-0.016 (-0.088, 0.056)
High School		0.093 (0.066, 0.120)	0.115 (0.079, 0.151)
College		0.040 (0.009, 0.070)	0.024 (-0.032, 0.079)
Late Life Income			-0.020 (-0.077, 0.036)
Childhood SES*High School		-0.029 (-0.086, 0.027)	-0.014 (-0.091, 0.063)
Childhood SES*High School*College		-0.0001 (-0.037, 0.037)	0.026 (-0.049, 0.102)
Childhood SES*Late Life Income			0.069 (-0.027, 0.166)
High School*Late Life Income			-0.034 (-0.097, 0.028)
High School*College* Late Life Income			0.020 (-0.047, 0.086)
Childhood SES*High School*Late Life Income			-0.078 (-0.181, 0.026)
Childhood SES*High School*College*Late Life Income			-0.037 (-0.122, 0.049)
Childhood SES*Years	0.145 (0.118, 0.172)	0.191 (0.092, 0.291)	0.222 (0.076, 0.368)
High School*Years		0.173 (0.111, 0.234)	0.177 (0.093, 0.261)
College*Years		0.097 (0.040, 0.155)	0.120 (0.001, 0.238)
Late Life Income*Years			0.349 (0.242, 0.457)
Childhood SES*High School*Years		-0.047 (-0.154, 0.059)	-0.091 (-0.250, 0.069)
Childhood SES*High School*College*Years		-0.034 (-0.104, 0.036)	-0.021 (-0.174, 0.133)
Childhood SES*Late Life Income*Years			-0.226 (-0.428, -0.023)
High School*Late Life Income *Years			-0.155 (-0.278, -0.032)
High School*College* Late Life Income*Years			-0.057 (-0.192, 0.078)
Childhood SES*High School*Late Life Income*Years			0.227 (0.009, 0.445)
Childhood SES*High School*College*Late Life Income*Years			-0.003 (-0.174, 0.168)
Wave: 2004	-0.105 (-0.112, -0.098)	-0.139 (-0.152, -0.127)	-0.159 (-0.175, -0.143)

Wave: 2006	-0.209 (-0.219, -0.199)	-0.275 (-0.297, -0.253)	-0.315 (-0.344, -0.286)
Wave: 2008	-0.303 (-0.316, -0.290)	-0.407 (-0.440, -0.374)	-0.467 (-0.511, -0.423)
Wave 2010	-0.452 (-0.469, -0.435)	-0.593 (-0.638, -0.549)	-0.678 (-0.736, -0.619)
Wave 2012	-0.549 (-0.569, -0.529)	-0.732 (-0.787, -0.677)	-0.840 (-0.913, -0.766)

All models are weighted to adjust for survival, participation, and exposure to high SES at each time point. The following variables were controlled for through direct inclusion in the regression: birth year, southern birth place, gender, and race.